Aug. 8, 1961 E. C. KIEKHAEFER 2,995,126

VALVE MEMBER AND METHOD OF MAKING THE SAME

Filed March 12, 1959

FIG. 1.

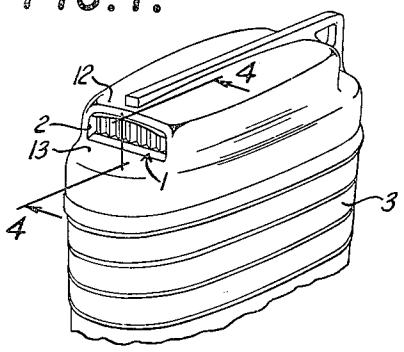
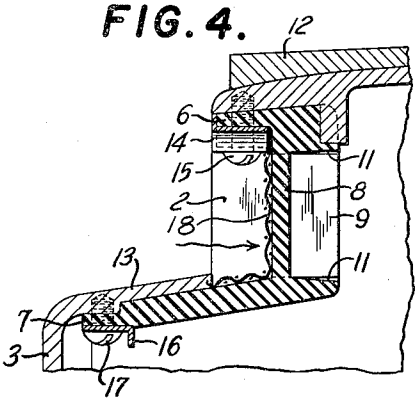


FIG. 4.



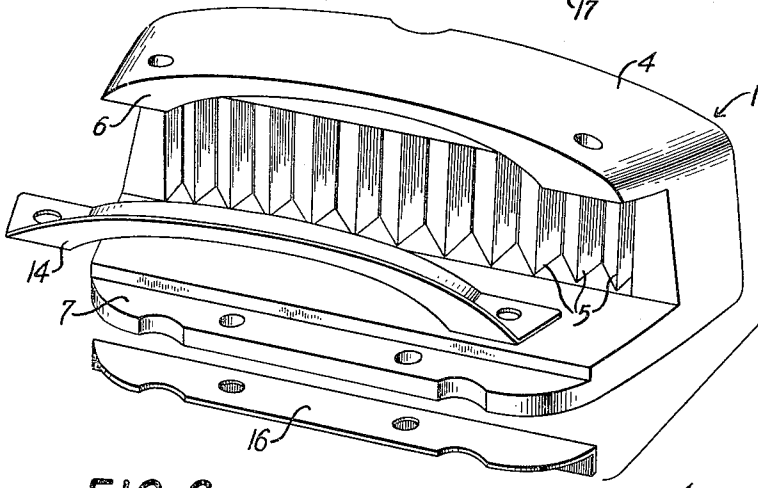


FIG. 2.

FIG. 6.

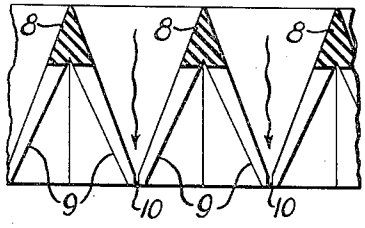
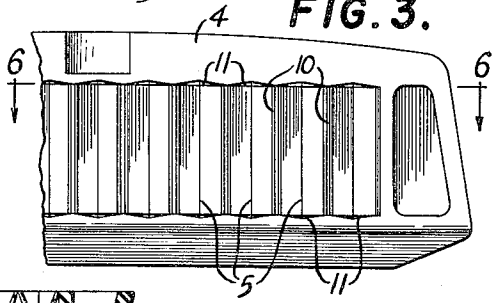


FIG. 3.



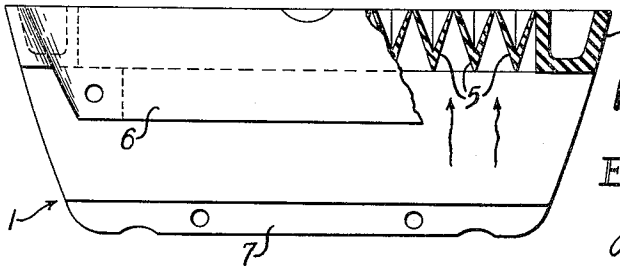


FIG. 5.

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United States Patent Office 2,995,126 Patented Aug. 8, 1961

2,995,126

VALVE MEMBER AND METHOD OF MAKING THE SAME

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Filed Mar. 12, 1959, Ser. No. 798,993
4 Claims. (Cl. 123—142)

This invention relates to a valve member and method of making the same and which has been applied to the air inlet for an outboard motor cowl.

The engine cowl of an outboard motor is commonly provided with an air inlet for the admission of combustion air. Generally, the inlet comprises a grilled portion which passes a considerable amount of engine noise. At high speed operation, wind and other boat noises tend to mask the noises emanating from the engine. At idle or low speed operation the engine noise remains at a high level. It is generally an object of this invention to provide an air inlet construction which will materially reduce the noise passing through the inlet during idle or low speed operation.

According to this invention, the outboard motor cowl is provided with a rearwardly facing air inlet opening. This opening is adapted to receive an inlet valve of molded rubber construction which comprises a plurality of flexible vanes which open and close in response to the pressure differential existing between the inside of the cowl and the atmosphere outside the cowl. The degree of vane opening is generally proportional to the pressure differential which in turn is determined by the quantity of combustion air required by the engine. Thus, at maximum speed the vanes would be open to their fullest extent. During low speed or idle operation, the vanes would be barely open, and consequently will materially reduce the amount of noise passing therethrough.

The accompanying drawings illustrate the best mode presently contemplated for carrying out the invention.

In the drawings:

FIGURE 1 is a rear perspective view of a portion of an engine cowl and shows the inlet construction of this invention;

FIGURE 2 is an enlarged perspective of the inlet valve member and further shows the retaining members for securing the valve member within the cowl opening provided therefor;

FIGURE 3 is a partial elevation of the inlet valve member as viewed from inside the cowl;

FIGURE 4 is a sectional view taken generally on line 4—4 of FIGURE 1 showing the valve member mounted within the cowl opening and additionally shows a screen disposed outwardly of the valve member;

FIGURE 5 is a plan view of the valve member with parts broken away and sectioned; and

FIGURE 6 is an enlarged sectional view taken on line 6—6 of FIGURE 3 to more clearly show the vaned construction of the valve member.

Referring to the drawings, the air inlet valve member 1 is mounted in a generally rectangular opening 2 provided rearwardly in the outboard motor cowl 3 as shown in FIGURE 1, and serves to admit combustion air for the engine, not shown, enclosed by the cowl.

The air inlet valve member 1 is an integral member of molded construction made of neoprene, rubber or the like. The valve member comprises a generally rectangular body portion 4 which surrounds and supports a bank of vertically extending V-shaped portions 5. An upper flange 6 and lower flange 7 extend rearwardly from the body portion 4 and are adapted for securement to the cowl 3 to seat the valve member 1 within the opening 2.

Each of the V-shaped portions 5 includes a rearwardly disposed apex portion 8 which extends vertically between the upper and lower reaches of the rectangular body portion 4 and is secured thereto. The V-shaped portions 5 further include the diverging vanes 9 which extend inwardly from the apex portion 8 and generally between the upper and lower reaches of body portion 4. The vanes 9 of adjacent V-shaped portions 5 are adapted to flex open to admit combustion air through the valve openings 10 between the V-shaped portions 5 of the valve member in response to a pressure differential across the member. When the motor is not running the vanes 9 of adjacent V-shaped portions 5 generally abut each other at their inner extremity to close the valve openings 10 of the valve member. The small relief cavities 11 are formed in the upper and lower reaches of the body portion 4 inwardly from the apex portions 8 so as not to impede flexure of the vanes 9.

In its manufacture, the valve member 1 is molded as an integral member and the bank of V-shaped portions 5 is formed as a closed, continuous corrugated section. After the molding operation is completed, the individual V-shaped portions 5 are formed by a series of cutting operations. The upper and lower extremities of vanes 9 are cut free from the upper and lower reaches of the body portion 4 inwardly from the apex portions 8 and the vanes 9 of adjacent V-shaped portions 5 are parted to form the valve openings 10.

The air inlet valve member 1 is adapted to be seated across the opening 2 in the cowl 3. The opening 2 is formed between vertically stepped cowl portions 12 and 13 which are engaged by the corresponding flanges 6 and 7 of the valve member. The upper narrow flange 6 of the valve member is assembled between the retainer bracket 14 and the cowl portion 12 and is secured to the cowl by means of the screws 15 which extend through the assembly. The lower wide flange 7 of the valve member extends beneath the cowl portion 13 and is assembled between the cowl portion and the retainer bracket 16 and is secured to the cowl by means of screws 17. If desired, a screen 18 may be placed across the opening 2 rearwardly of the bank of vanes 5 as shown in FIG. 4 to prevent larger bits of foreign matter frequently carried by the air from entering through the valve member 1.

During periods when the motor is not operating there is no pressure differential across the valve member and the valve openings 10 generally remain closed. During operation of the motor, the engine requirements for combustion air create a pressure differential across the valve member 1 to flex the vanes 9 to an open position and permit passage of air to the interior of the cowl. The size of the valve openings 10 is generally determined by the extent of the pressure differential between the inside and the outside of the cowl, and this in turn is dependent on the engine requirements. Generally, at high speed operation, the valve openings 10 will be open to their fullest extent to permit a maximum flow of air into the cowl. At idle and low speed operation, on the other hand, the valve openings 10 may be nearly closed.

This difference of valve accommodation between high speed and idle or low speed operation is very important from a noise standpoint. At high speed operation, the engine noise passing through the open valve member is generally only a fraction of the total noise inside with high speed motor operation. Generally, wind and other boat noises substantially mask or drown out the engine noises passing through the valve member. At idle or low speed operation, however, the engine noise can be a significant portion of the total noise incident with operation of the motor. With the openings 10 of the air inlet valve member of this invention nearly closed at

idle or low speed operation, the engine noise passing therethrough will be materially reduced, resulting in a lesser total noise level. With the inlet opening 2 disposed rearwardly of the cowl, it should be noted, too, that whatever noise does pass through the valve member is directed rearwardly away from the operator.

The invention provides a further advantage as a safety feature. In the event of an internal explosion within the cowl, the flexible vanes permit the expanding gases to discharge through the cowl opening 2 and thereby reduce the pressure buildup within the cowl and remove the danger of cowl failure. Placing the inlet opening 2 in the rearward portion of the cowl assures that the gases resulting from such a mishap will be directed away from the operator.

The invention as herein described and illustrated has been applied to outboard motors. In its broader aspect the valve of this invention may be applicable to other uses.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In an outboard motor having a cowl forming an internal-combustion engine chamber, said cowl having an inlet through which air passes for engine combustion, a valve member disposed in said inlet and having flexible vanes, said vanes being disposed in pairs with the ends thereof normally being in engagement to close the valve member, each said pair of vanes being adapted to flex open in response to a pressure differential between the inside and outside of the cowl to provide for admission of combustion air into the cowl.

2. In an outboard motor having a cowl forming an internal-combustion engine chamber, said cowl having an inlet through which air passes for engine combustion, a valve member disposed across said inlet and comprising a bank of V-shaped portions, said V-shaped portions each including an apex portion and a pair of flexible divergent vanes extending from the apex portion, the ends of the vanes opposite from the apex portion normally engaging the corresponding end of the vane of the adjacent V-shaped portion to close the inlet, the vanes of adjacent V-shaped portions being adapted to flex to an open position in response to a pressure differential between the inside and outside of the cowl to form valve openings therebetween for the admission of combustion air.

3. In an outboard motor having a cowl forming an internal-combustion engine chamber, said cowl having an inlet through which air passes for engine combustion, a valve member of molded rubber or the like comprising a body portion adapted to be secured to the cowl and across said inlet, a series of V-shaped portions disposed within said body portions, said V-shaped portions each including an apex portion molded integrally with the body portion and a pair of flexible divergent vanes extending from the apex portion, the ends of the vanes opposite from the apex portion normally engaging the corresponding end of the vane of the adjacent V-shaped portion to close the inlet, the vanes of adjacent V-shaped portions being adapted to flex to an open position in response to a pressure differential between the inside and outside of the cowl to form valve openings therebetween for the admission of combustion air.

4. A molded rubber valve member, comprising a generally rectangular body portion, a bank of parallel V-shaped portions extending side by side between the upper and lower reaches of said body portion, said V-shaped portions each including an apex portion secured between the reaches of said body portion at one side and a pair of flexible divergent vanes extending from the apex portion to the other side of said body portion, the edges of the vanes opposite from the apex portions normally engaging the edge of the vane of the adjacent V-shaped portion to close the valve, the vanes of adjacent V-shaped portions being adapted to flex to an open position wherein said normally engaging edges are at least partially separated in response to a fluid pressure on the apex side providing a differential across the valve to form valve openings therebetween for the passage of a fluid from the apex side to the opposite side of the valve.

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